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RENAL DECAPSULATION AND NEPHROTOMY IN THE TREATMENT OF THE SERIOUS FORMS OF ECLAMPSIA.

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THE pathogenic theory of eclampsia at the present time admitted by the majority of obstetricians, is that of a blood intoxication produced by a poison whose origin and nature still remain undetermined. To this toxemia primary or secondary lesions of the liver and kidneys become added; consequently injury to the two most powerful emunctories of the organism results in an aggravation of the condition. This conception, to which laboratory researches combined with clinical observation have given a character of an almost inattackable scientific truth, has resulted in the treatment of eclampsia founded on a solid basis. In truth it has not given rise to any therapeutic revolution, but it has affirmed the great power of an already old method and which, because it has not inspired the confidence which it merits, has been too infrequently and unenthusiastically employed up to the present time in order to show all the success which may be derived from it.

This method consists in the use of those means by which the blood may be purified, and they are numerous. In the first place we have milk diet or even the water diet, which reduces intestinal fermentation to the minimum, consequently the production of the toxins; and in the same order, we have repeated enteroclyses, after which purgatives and blood-letting come in play, the latter directly removing from the organism adulterated blood; and finally hypodermic injections of normal salt solution which result in a flushing both of the tissues and the blood.

As may be seen, this method of treating eclampsia deals

directly with the toxemia, but neglects the renal and hepatic lesions which are only indirectly influenced by it. Without any doubt the abundant flow of bile which ordinarily follows enteroclysis indicates its action on the liver whose functional activity it excites, just like the diuresis which frequently follows a subcutaneous injection of salt solution, thus making its action on the kidneys evident. But is it always thus? And as far as the latter organs are concerned do not injections of salt solution act unfavorably on account of the chloride of sodium they contain and whose introduction into the body is at the present time considered contraindicated in uremic conditions, and by the water itself, which, raising the blood tension in the renal vessels as well as those of the other viscera, is rather more fitted to aggravate their lesions on account of the increased work that it imposes upon all their anatomical elements and the epithelium in particular. The toxins carried by the blood still more increase these dangers as far as the renal parenchyma is concerned.

It is, in the first place, in order to remedy these possible bad effects resulting from the treatment by lavage of the blood, and secondly in order to render blood-letting more efficacious, and lastly to do away with the renal lesions, that we have decided to interfere surgically on the kidneys in cases of eclampsia. But we would immediately remark that we have not the pretension of substituting this operative treatment for medical treatment. We only present it as a new resource to be added to those already in our possession in order to conjure the effects of the toxemia of pregnancy. For example, we believe that in instances of serious intoxication which have resisted all the medical means which we have enumerated above, particularly in cases accompanied by oliguria with a decrease of urea and other extractive matters of the urine along with a large quantity of albumin, surgical interference is justified and is even absolutely necessary when a histological examination of the urinary deposit shows the presence of the characteristic figured elements of acute nephritis.

Edebohls, who has pursued investigations on the operative treatment of acute and chronic nephritis along the same lines as one of us, although independently, has had the opportunity of successfully applying his method of renal decapsulation in two cases of eclampsia. Our case, also ending by recovery, can be

added to his in order to demonstrate the excellent effects of surgical interference in this serious morbid complication of pregnancy. But while the American surgeon resorted to decapsulation of both kidneys in his cases, we have added nephrotomy on the right kidney along with bilateral decapsulation.

The considerations that we shall develop after having given a detailed report of our case will show the great advantages obtained by the combination of an incision of the kidney and decapsulation.

Mrs. D. seamstress, 21 years of age; no family antecedents and having very good health, menstruated at fourteen and a half years of age, became pregnant several months after her marriage. Pregnancy in the first place progressed without any incident, but towards the eighth month the patient noticed that her face was slightly puffed in the morning, and from time to time she experienced continued headache. A few days before term she consulted a midwife, who found traces of albumin in the urine and prescribed an absolute milk diet.

The next evening, January 14, the first pains were felt and the midwife was at once called. Examination showed that the cervix had commenced to dilate, but that labor was very slow, the pains few and far between and very light. A few hours after the commencement of labor the patient, who had been cheerful and talking with those present, stopped speaking and hardly replied to questions and not always correctly when they were asked her. She fell into a kind of somnolence between each pain, and the irregular respiration appeared hindered. To this torpor some convulsive movements of the limbs soon became added and finally a marked attack of eclampsia took place. A physician summoned prescribed an enema of chloral. The convulsions became fewer and the patient fell into a state of semi-coma, which continued all night. The urine obtained by catheter, (the patient not having urinated for about ten hours), was small in amount, about a dessertspoonful, and became completely coagulated upon heating.

In the morning of January 15th, about sixteen hours after the commencement of labor, digital dilatation of the cervix was done, resulting in the delivery of a dead child. The placenta was delivered without difficulty and the loss of blood was small.

The coma continued during all these manœuvres and an hour and a half after the delivery a very violent attack of eclampsia occurred, the patient biting the tongue, after which she again fell into a deep coma. The coma continued for twenty-four hours, during which time there were three or four convulsions.

Dr. Beely, the patient's physician, called us on January 16th at nine o'clock in the evening. We found the patient plunged in an unconsciousness from which nothing could rouse her. The arms and lower limbs were absolutely inert and when raised up would fall lifeless on the bed. The eyelids, which were partially opened, closed of themselves, the pupils were dilated and did not react to light. The respiration was stertorous, regular and slow. The pulse was full, regular, 108; temperature 37°.8C.

Since the catheterization done before the delivery the patient had not voided urine spontaneously, but about 200 cc. of dark ebony-colored urine had been withdrawn by several catherizations and this contained a large amount of albumin. The catheterization that we performed withdrew 75 cc. of urine, the analysis of which gave the following results: Sp. gr. at 15° C., 1012; reaction, hypoacid; color, dark yellow; aspect, cloudy; sediment, abundant; urea, 8 grm. per litre; total phosphoric acid, 0.85 per litre; sodium chloride, 4.10 grm. per litre; albumin 6.50 grm. per litre. There were also numerous leucocytes, red blood cells and epithelial débris.

On account of the coma which had now lasted for thirty-six hours in spite of the labor, and especially on account of the oliguria, we decided to operate, which was done the same evening at nine o'clock.

Although comatose and unconscious the patient was nevertheless given a few whiffs of chloroform. The left kidney was first exposed by an oblique incision extending from the last rib to the antero-superior iliac spine. The fatty tissue was found greatly thickened and infiltrated, the muscles pale and water-logged; finally a large quantity of serous fluid escaped upon incision of the fatty capsule of the kidney. The kidney was easily brought up into the incision; it was brown in color, grossly lobulated and of very firm consistency. Its longitudinal diameter was not increased, but its transversal diameter was considerably enlarged, so that the organ appeared rounded. The capsule being

incised over the convex border was peeled off with great ease and the parenchyma of the kidney then appeared less dark in color than before decapsulation, it being more like the hepatic parenchyma in hue. The lobulated condition was more distinct; a very slight oozing of blood, which was easily controlled, occurred during decortication. The kidney was then put back in place and gauze was inserted underneath its lower pole and the lumbar incision was closed, catgut being used for the muscles and silkworm for the integuments.

The patient being turned on the other side so as to expose the right lumbar region, the same incision was made as on the left. The infiltration of the fat, muscles and renal capsule was distinctly more pronounced than on the opposite side. The kidney being rapidly brought up into the wound was enlarged and cylindrical in form, brownish in color, of very firm consistency, but less lobulated than the left kidney. The capsule having been incised on the convex border, the borders of the incision immediately spread apart and the renal substance tended to form a hernia, proving the compression exercised by the capsule. Decortication having been done the organ lost its dark color, becoming a brownish red. An incision extending from pole to pole was carried down to the renal pelvis, giving issue to a very abundant escape of black blood, and little by little as the bleeding continued the renal parenchyma took on its normal light red hue. After having removed a small fragment of parenchyma from each side of the incision, in order to have it microscopically examined, a Pezzer catheter was inserted in the renal pelvis, after which the kidney incision was sutured above and below the exit of the catheter with six catgut sutures. The organ was then replaced in the lumbar fossa and a gauze drain was inserted under its lower pole, after which the incision was closed.

The operation lasted a little less than forty minutes. The patient received only a few whiffs of chloroform, after which its administration was stopped, but remained unconscious and did not come out of her coma.

January 17. The comatose state continued the entire night, but appeared less profound in the morning; sensibility to pricking, nil yesterday, is present, especially on the left side; the respiration is calm, sighing and occasionally showed the phenomenon

of Cheyne-Stokes. Pulse 120. Temperature 38°.8 C. No spontaneous micturition. By catheter 180 grm. of thick dark urine, having a fetid odor, was withdrawn. The dressings were thoroughly soaked, especially on the right (the side of the nephrotomy), with a liquid having a urinous odor and a marked red color. In the evening the coma was less profound. The sensibility had returned and was manifest over the entire body. When spoken to the patient opened her eyes and appeared to understand what was said to her, but did not reply to questions. Cheyne-Stokes respiration no longer present, respiration 44. Pulse regular, well struck at 120. Temperature 38°.4. Spontaneous micturition had not occurred and only 90 cc. of thick cloudy urine was withdrawn by the catheter, but the dressings were thoroughly soaked on both sides.

January 18. Night good. The patient, who, up to this time, had been immovable and inert in her bed, had made a few movements and in the morning came out of her stupor. She opened her eyes and followed those who approached her bed, appearing to well understand what was said to her, but still did not reply to questions. Respiration calm, regular, 40 per minute. Pulse 104. Temperature 36°.8. During the night 300 cc. of urine were voided by spontaneous micturition. Dressings thoroughly soaked; the gauze and absorbent cotton weighed 800 grm., but the bandage and pillow were also very saturated. On account of the considerable quantity and fetid odor of the lochia, vaginal irrigations of potassium permanganate were ordered. In the evening the patient had completely recovered from her coma, talked with her husband and others, but did not appear to have any idea of her condition, nor where she was. Temperature 36°.9. Pulse 96.

January 19. The night was excellent, sleep quiet. The patient expresses herself as feeling well and only complains of being constantly moist. She remembers nothing of what has taken place since her first convulsion and does not appear to wish to know whether she has been delivered or not. Temperature 36°.8. Pulse 96. Milk diluted with Vittel water. The dressings are still very soaked on the right, the urine coming partly from the drain and partly from the wound. On the left the dressings are dry and the wound has united except at the point where the gauze

drainage makes its exit. Seven hundred and fifty cc. of urine voided by the bladder. The weight of the dressing is 450 grm. During the evening the patient talked with her relatives of various indifferent things, but did not appear conscious of where she was. Slightly excited. Temperature 37°.3. Pulse 112.

January 20. Night good. Patient frequently asked to drink; milk given. The patient talked and laughed with those present, but did not recall anything which took place on the day of her labor and did not ask to know what had become of her child. The serous and bloody lochia are still possessed of very bad odor. The uterus was large and painful when pressure was brought to bear over the hypogastrium. Temperature 36°.8. Urine 2200 cc. Vaginal irrigation with potassium permanganate.

January 21. General condition still good, but the temperature rose to 38°. Urine 2700 cc. The gauze drainage on both sides was removed, but the drain in the right renal pelvis was allowed to remain. The lochia was no longer fetid, but the uterus remained large, so that the permanganate injections were still continued.

January 22. For the first time the patient asked about her child and was told that it was quite well in order to avoid any mental shock.

The drainage tube was removed from the right kidney on January 28, that is to say twelve days after the operation, and the wound closed completely four days later. Although the patient felt perfectly well, the temperature still oscillated between 37°.5 and 38°.5 for about two weeks, which we attributed to the uterus which underwent a very slow involution. The patient left the hospital on March 9th. We have seen her several times since and have noted a perfect integrity of her health. At the present time, thirteen months after the operation, her health is excellent and the urine no longer contains albumin.

The condition of affairs that we were able to observe during the operation confirms an anatomical fact that at the present day is well known relative to the somatic lesions of eclampsia, namely, that in our patient a bilateral nephritis was present. In point of fact, when the kidney was drawn up in the wound it appeared with all the macroscopical characters of this affection, namely, an increase in size and consistency, a brownish color and so forth,

and the two small fragments removed from the organ at the time of the operation when microscopically examined, presented the lesions of acute parenchymatous nephritis. The following is the report of the examination made by Dr. Auché: Glomerulitis; the vascular loops are greatly dilated, the number of the nuclei is increased, the cells of Glisson's capsule have disappeared in spots and are replaced by an exudate interposed betwen it and the glomerulæ. The lumen of the descending loops of Henle is slightly increased, the epithelium is nearly everywhere involved and in certain places one cannot distinguish the badly stained nucleus, while pushed against the basal membrane, the lumen of some of the collecting tubes is replaced by a homogenous substance stained red and probably colloid in nature; periarteritis of the small arterioles; in the connective tissue stratum are a few leucocytes in a greater number than normal. Certain pathologists contest the existence of eclamptic nephritis, believing that histological examinations are without value, considering that the changes found are cadaveric lesions. The examination of the bits of renal tissue in our case taken during life and immediately fixed in alcohol do away with this objection. A second clinical fact which is made evident in our case is the cessation of the nephritic process and the re-establishment of the secretory function of the kidney following decapsulation and nephrotomy, and, as a matter of course, the cure of the eclampsia.

Pathological physiology permits one to interpret this triple action. Its mechanism does not differ from that which one of us has put forward in order to advise surgical interference in the treatment of acute nephritis and uremic attacks in chronic nephritis.

First. *The manner of action of renal decapsulation and nephrotomy on the lesions of eclamptic nephritis.*

Reginald Harrison, who was the first to interfere by nephrotomy in acute nephritis, was led to this undertaking from the rôle that he attributed to intrarenal tension in the evolution of the anatomical process. The effects of this tension on the elements of the renal parenchyma are, according to his way of thinking, comparable to those of intraocular tension in glaucoma, and puncture and incision of the capsule of the kidney act like the operation of iridectomy first advised by von Graefe.

Employing another comparison which appears to us more exact, the London surgeon assimilates that which takes place in the tissues of an inflamed kidney compressed in its capsule, to the limited extensibility taking place in the testicular tissue during the progress of certain cases of orchitis, in which one encounters histologic elements undergoing necrobiosis if an early incision is not made in the albuginea. As one of us has pointed out, it is proper to add to this first effect resulting from the suppression of the intrarenal tension, that obtained by the free issue of blood produced by the incision of the kidney itself, which realizes to the highest point the effects of local blood-letting, so much sought after in daily practice by the use of cupping and leeches applied to the lumbar region. The flow of blood thus produced, besides its action on the renal congestion and its moderating influence over diapedesis, favors the exodus of the exudates and epithelial débris which encumber the canaliculæ involved in the incision, all agents which mechanically contribute in the production of oliguria and anuria. The removal of the obstruction even continues for some days afterwards if the renal pelvis is drained with a tube, thus allowing the flow of altered liquids secreted by the kidney and renders possible the use of antiseptic irrigations.

Edebohls, in his operations, has only resorted to bilateral decapsulation. For the reasons that we have given we believe that one should also make an incision in the kidney, at least on one side. This incision does not increase the gravity of the interference and has still other advantages that we will now point out.

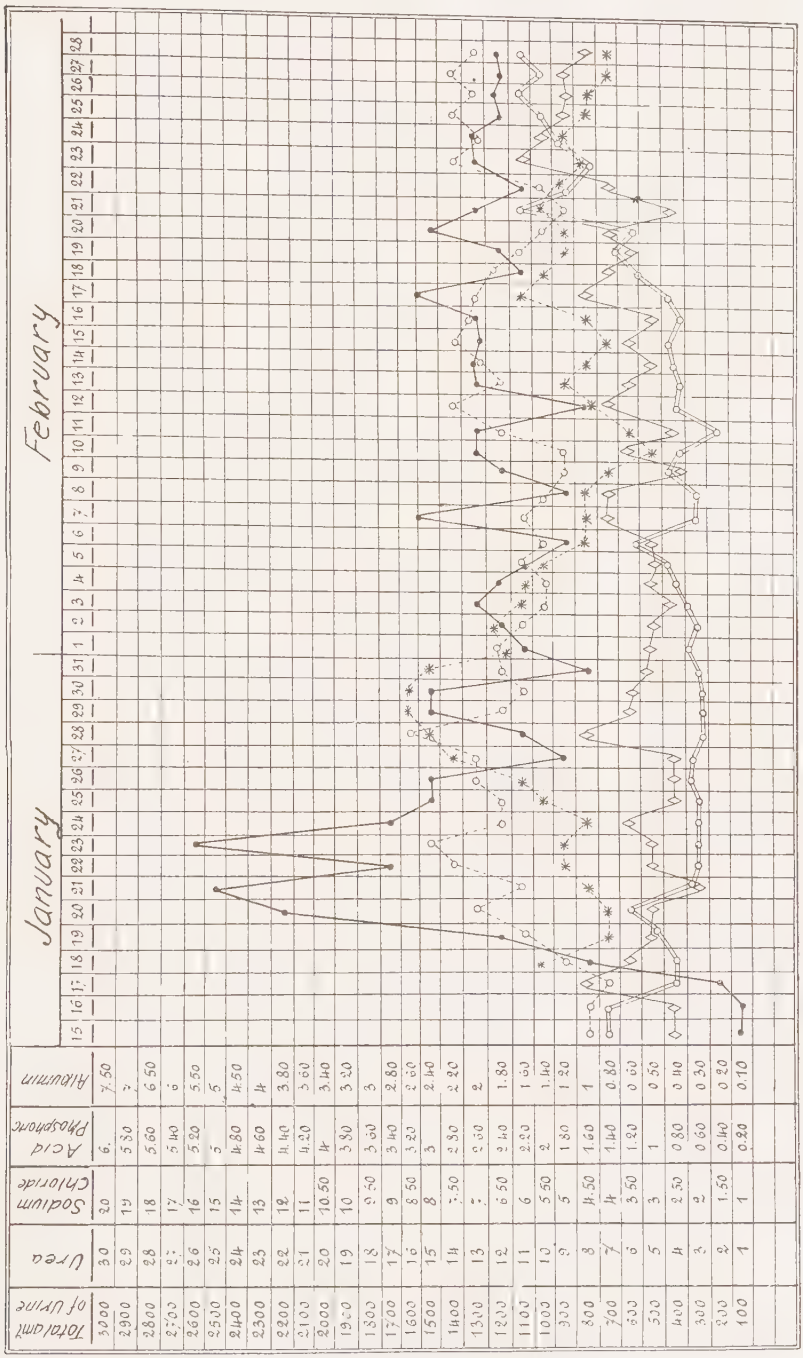
Second. *The manner of action of decapsulation and nephrotomy on the return of the secretory functions of the kidney.*

It is again by doing away with the renal hypertension that these operations allow the kidneys to recuperate their physiological functions. It is known that Guyon and Albarran, basing themselves on experimentation and clinical observation, have demonstrated on the one hand, the effect of intrarenal tension, which has, as a result, much perturbation in the urinary secretion, and on the other hand, the happy effects accruing from incision of the renal parenchyma under these circumstances. Applying this knowledge gained in patients afflicted with surgical renal diseases to the medical affections of the kidney, one of us has successfully undertaken nephrotomy in a certain number of cases of acute or

chronic nephritis, complicated by oliguria, diminution in the excretion of urea and other products of the urine. In eclamptic nephritis, as in the nephritis of infectious diseases and the subacute attacks producing uremia in Bright's disease, intrarenal hyertension results from the increase in size of the kidney due to the exudates and the products of cell proliferation held under its inextensible capsule. This hypertension, acting on the vessels and the nerves, in the first place profoundly modifies the circulation and innervation of the organ and soon acts on the epithelial structures, resulting in disturbances of their functions by influencing their vitality or even bringing about their death. From this one may easily understand, without it being necessary for us to insist, the happy effects of removal of the capsule, and still better, incision of the renal parenchyma. As may be seen by the clinical chart here appended of our case, the total amount of urine, urea and the salts, with the exception of the chlorides, rapidly increased after the operation, so that, in this case of eclampsia, as in our other cases of nephritis, the interference acted, if we may be allowed the expression, like opening a stop cock to the flow of urine.

Third. *The manner of action of nephrotomy on the toxemia.* Now, as we pointed out at the beginning of this paper, general blood-letting, which subtracts from the organism a portion of the blood filled with toxins, is one of the most powerful means in our possession for combatting eclampsia. Now, nephrotomy, besides possessing the advantage of realizing quite as well as phlebotomy this therapeutic indication, fulfills the rôle of the liver by directly removing poisoned blood, because the pathologic changes of the hepatic parenchyma prevents it from purifying the blood. In order to explain the genesis of uremic attacks occurring in Bright's disease, Dieulafoy has emitted the opinion that the secretory elements of the kidney undergo intoxication from the blood carrying the toxins, producing a kind of *renal uremia.* Cannot a similar hypothesis be invoked during the progress of a toxemia of pregnancy? And if this be admitted, does not incision of the kidney appear the best means of removing the toxins which saturate the renal parenchyma?

PLATE IV.—To Illustrate the Article by Prof Pousson and Dr Chambrelent



CLINICAL NOTES.

By Dr. F. Kreissl, Chicago.

I. ABDOMINAL AND VAGINAL URETER FISTULA CLOSED BY CATHETER LEFT IN INJURED URETER FOR THIRTEEN DAYS.

September 29, 1904, Dr. L. A. Stillman of Chicago performed a hysterectomy which was rendered very difficult on account of the size of the mass to be removed and complicated by a psoas abscess and by unusually extensive adhesions. The evening temperature rose to 102°, pulse 120, and remained so for the four following days, emesis being present all this time. October 1st, intense pain in the right side was complained of. October 4th, the evening temperature dropped to 99.2°, pulse to 86. While dressing the wound October 5th, a strong amoniacal odor was noticed and upon inspection a urinary fistula in the laparotomy wound and in the vaginal vault discovered, through which urine leaked freely for the following eight days. October 13th, I was asked by Dr. Stillman to make a cystoscopic examination to determine the origin of the leak. I found a normal bladder, a perfect working left ureteral os, but the right ureteral orifice wide open, motionless. Passing a catheter No. 7 French scale into this ureter it semed to be checked in its further progress four inches from the orifice, but upon pushing it on with a very slight effort the tip seemed to glide over an impediment with a jerk and moved easily upward until the marking outside indicated that it had arrived in the renal pelvis. On its way to the obstruction nothing came through the catheter, but as soon as this was passed and all the way up to the pelvis urine containing much pus ran out of it as if under pressure.

At 2:30, two hours after the catheter was placed in the ureter, the dressings covering the fistula were found dry and remained so thereafter. The leakage through the vaginal vault had also ceased. The catheter was left *in situ* and through it the renal pelvis irrigated with antisceptic solutions three times daily.

The bladder was also antiseptically treated through a catheter introduced alongside the other instrument. The urine coming through the ureter catheter was measured daily and examined in the laboratory. It averaged twenty-four ounces; the quantity of pus and albumen being very high the first day decreased gradually, while the percentage of urea rose from 0.1% to 1½% and the specific gravity from 1006 to 1016 at the end of ten days. The fistula was completely closed October 20th. The temperature and pulse during all this time were normal; no pain along the urinary route complained of; in fact, the patient, a very nervous woman, was so little inconvenienced by the presence of the catheter that on October 24th she dressed and left the hospital for a few hours to attend a dinner party. October 27th, I removed the catheter and found both ureteral openings alternately emitting jets of urine by normal rhythmic contractions. A short time ago Dr. Stillman brought the patient to me for re-examination—it is now sixteen months since she left the hospital—and we found her in perfect health; her urinary functions and the urine being normal in every respect.

This case is instructive for several reasons. It demonstrates again the value of the ureter catheter for therapeutic purposes on *suitable* occasions, as in this one where it has returned to perfect function a damaged ureter and saved a kidney which otherwise perhaps, would have to be removed to cure the urinary fistula. It further shows the fallacy of the statement emanating, I think, from Winter, and regarded as an axiom by others, that in transverse lesions of the ureter the os will be seen absolutely motionless, while in lateral injuries the orifice without emitting any urine will open and close although not so complete and regular as under normal conditions. If this ureter had been severed transversely during the operation September 29th, it does not require any further explanation why a catheter could not have passed out from the lower and in again in the upper cut end, October 13th.

Lastly I wish to say that when I suggested this method for such and similar purposes about four years ago a reviewer of my paper questioned its feasibility because of the ill results on the urinary tract produced by a foreign body left therein so long. I have never found the procedure being associated with any inconvenience to the patient or followed by any lesion to the parts it

comes in contact with as long as one uses the necessary precautions. These are, absolute cleanliness and delicacy in introducing and placing the catheter so as to avoid traumatic lesions, and frequent washing of the renal pelvis, which has to be more frequent the more concentrated urines we encounter, or else urinary salts will be deposited in and on the catheter which will act as a chemical irritant outside and plug the lumen within causing urine leakage alongside of the catheter. In this way prompt closure of the defect will be prevented.

II. PRIMARY TUBERCULOSIS OF THE BLADDER AND LOWER END OF THE URETER CURED BY LOCAL TREATMENT.

The report of this case was deferred for more than a year because I thought sufficient time should be given to demonstrate the lasting result.

The patient, a robust girl, aged 18, was seen by me in consultation with Dr. I. A. Abt of Chicago on June 25th, 1904. She gave the following history: October 1904, owing, as she thinks, to a severe cold contracted during menstruation, frequent and painful urination set in. Rest in bed and internal medication kept up for several weeks having failed to relieve her, bladder irrigations were added which made the condition decidedly worse; terminal tenesmus occurred, the urine became more turbid than before and had to be voided every 15 to 30 minutes. Patient was not noticeably reduced in weight during all this time—about eight months—in spite of loss of a good deal of sleep and much suffering from pain.

In the cystoscopic examination a number of typical small-sized tubercules were seen in the trigone and a few in the corpus above the interureteric ligament. The right ureteral orifice appeared normal, the left one was surrounded by an elevated, cone-shaped, infiltrated and congested area; (close to the orifice a tuberculous ulcer was established), the rest of the bladder cavum seemed healthy. Passing the first three inches of a catheter into the left ureter, I obtained an almost creamy fluid containing many fragments of inspissated pus. Gradually passing the catheter higher up the urine became clearer and free from fragments until about six inches from the orifice it was transparent. In view of

the previously mentioned conditions in the bladder and in the vesical portion of the ureter, I did not venture to pass the catheter higher up. The microscopic examination of the bladder urine and the one obtained separately from the left ureter, showed very few blood-cells, pus-cells, a few streptococci, and no tubercle bacilli. This result was corroborated by the Columbus Laboratory who received a part of the same specimen for examination. In a second examination of the urine, June 29th, a few tubercle bacilli were found in that portion which was taken from the lowest three inches of the ureter; but none in that from the middle part. On this occasion several well-developed ulcerations were observed in the trigone. The largest ones were far away from the left ureteral orifice.

July 5th, a guinea pig was inoculated which died July 30th. The report from the Columbus Laboratory read: "Animal emaciated. At point of inoculation area of tuberculosis; bacilli present; glands, liver and spleen tubercular."

In view of the peculiar condition of the urine in the different portions of the ureter and the fact that no bacilli were found in the middle section, the possibility of a primary and ascending infection of the bladder strongly suggested itself and local treatment commenced July 5th. It consisted of instillations of 5% iodoform guaiacol suspensions, alternating with bichloride solutions in the bladder and in the lower segment of the ureter. Under this treatment the subjective symptoms improved rapidly and the ulcers healed within a month, while it took the tubercles about two months longer to disappear. Simultaneously with the latter, the tubercle bacilli disappeared from the urine, which became quite clear and has remained so since, as frequent examinations in the Columbus Laboratory have demonstrated.

An inoculation test made in Colorado where the patient spent a few weeks in the summer of 1905, gave a negative result. I saw her again a few weeks ago and found her enjoying perfect health.

III. RENAL CALCULUS OF UNUSUAL SIZE.

This specimen is from the right kidney of a patient, forty-one years old, sent to me by Dr. A. C. Crofton of Chicago. The short history given me is this: He had renal colic on the left side in

November, 1891; shortly afterwards, and since that time, he was unable to void urine in any other but the recumbent posture. March, 1892, a vesical calculus, removed by Dr. McArthur, by suprapubic lithotomy. Very soon again renal colic on the left side, appearing at longer or shorter intervals, until spring of 1903. X-ray picture taken at this time was negative. He was put on calcium carbonate medication by Dr. Crofton, following which no renal colic was experienced for over six months.

October 25, 1903, urine retention, necessitating drawing of the urine for three days. The latter was alkaline, which was attributed to the calcium carbonate. In a cystoscopic examination, October 27th, I found a vesical calculus, purely phosphatic, of the size of a hazelnut, which I removed by lithotripsy. The subjective symptoms of the cystitis yielded to local treatment within a few weeks following the operation, but the urine remained turbid and alkaline. December 22nd, he returned with dull pain in the *right* lumbar region and severe tenesmus. Through the cystoscope the bladder wall looked normal, with the exception of a small congested area near the right ureter. Catheterizing both ureters simultaneously, I collected 50 c.c. of clear and acid urine from the left kidney, and 100 c.c. of cloudy, alkaline urine from the right, which first came in a continuous stream, and with great force, as I have always observed in hydronephrosis and pyelitis with pelvo-renal retention. Here follows the result of the urine examination, furnished by Dr. Crofton:

RIGHT.	LEFT.
Quantity, 100 c.c.	50 c.c.
Reaction, Alkaline (!),	Acid.
Spec. Grav., 1019,	1016.
Urea, 1.4 per cent.,	0.2 per cent.
Color, yellow (cloudy),	Yellow (clear).

Sediment, right, pus abundant. Few red blood cells; abundant crystals of calcium oxalate; amorphous urates, and staphylococcus.

Left, no pus. No blood. No staphylococcus. Urine sterile. Ordinary sediment, with excess of oxalate and urate crystals.

I irrigated the right renal pelvis with oxycyanide of mercury

solution, and injected 4 c.c. of a 1-1000 nitrate of silver solution before withdrawing the ureteral catheter. Urotropin internally, and the same application repeated every third day for three weeks, did not change the condition of the urine, although there was temporary relief from lumbar pain for a day or so following each ureteral catheterization. An X-ray exposure of the right kidney on January 25, 1904, showed two small shadows, as you may observe on the photograph. February 14th, making a lumbar incision in the right side, I exposed a very large kidney, extending far up under the ribs and the vault of the diaphragm, the pedicle shortened and stiffened by dense contracted tissue, which tucked the kidney close up against the spinal column. Much difficulty was experienced in freeing the stone from its encasement, from which it had to be cut out. After removing the large upper part of the calculus, I was able to get at the smaller ones, which filled the infundibulum and extended into the ureter. The accompanying figure conveys an idea of the situation of the stone in the kidney. Its total weight, including two calyx branches, scooped out separately and lost, is two ounces. Though badly infected, I did not remove the kidney because of its apparent much better functional activity than the one of its mate, as indicated by the previous result of the examination of the segregated urine. This conclusion was sustained by the fact that the bladder remained dry for forty-eight hours after the operation, while the dressings on the operated side were so much saturated that they had to be changed every few hours.

An examination of a resected piece of the kidney by Dr. Crofton shows the parenchyma not involved, but an ascending infection of the uriniferous tubules. No miliary abscesses within the kidney substance. The glomeruli were not involved. Patient made a good recovery.

Here we meet again the defects in X-ray diagnosis of kidney disease, which long before this induced me not to rely upon it, but to be guided by the clinical symptoms, supported by the result of urine segregation. The vast majority of suppurating or bleeding kidneys are at any rate surgical kidneys, at least warranting an exploratory lumbar incision or a nephrotomy.

PLATE V.—To Illustrate the Article by Dr. F. Kreissl.

THE SURGICAL ASPECTS OF ANURIA.[1]

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BY the word anuria, is understood that condition in which no urine is formed in the kidney; in other words, there is a complete absence of the secretion. Anuria following abdominal operations occasionally arises, but does not last more than forty-eight hours, but one case has been recorded in which there was suppression of the urinary secretion for twenty-five days, although the subject appeared to be perfectly well during this time. The urine then began to come away and gradually attained the normal amount. There are other cases, however, where anuria of several days duration sets up phenomena met with in uremia, and it is quite true that in certain pathologic conditions resulting in the development of deleterious substances in the blood, the patient may be in a very serious condition. These substances are the urinary toxins, combined with the biliary constituents and CO.[2] Understood in the strictest sense, anuria only occurs in functional disturbances of the kidney, or in the various renal affections, but in a broader sense one can include under this name all those abnormal conditions in which the urine is prevented from reaching the bladder. Thus we have obstruction arising in the ureter or renal pelvis, giving rise to suppression, and which may be classed among cases of anuria. True anuria arises when the arterial blood no longer reaches the renal gland, or the escape of the urine secreted in the glomerulæ is prevented by some obstacle met with along the genito-urinary tract.

I would like here to outline a classification of conditions giving rise to various forms of anuria, with the hope that the subject may be made as simple as possible. I will first consider those cases resulting from reflex action, and here one is dealing with anuria produced by some irritation in another organ, and by way of the nerves the reflex action is carried to the kidney, resulting in suppression of secretion. In this class belongs anuria of hys-

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teria and toxic anuria arising from the intestinal canal. There are also instances of suppression of the urine resulting from an irritation arising in one kidney and, by what is probably a reflex action, prevents the secretion of urine in the healthy organ as well. According to Cohnheim, the anuria of pregnancy should also be considered as of reflex nature, and may be traced back to contraction of the renal arteries, but, however, I believe that in these cases an inflammatory process is really at the bottom. As an intermediary or transitional class, we should include those cases of anuria which result from an obstruction at some part of the urinary canal, as occurs in certain infectious processes. Here, in all probability, the circulation becomes arrested in the kidney, usually as a result of cardiac weakness, or on account of an increased density of the blood, but the urinary canals of the kidney are usually filled with small plugs of casts, being in reality an obstructive process. The second group includes the anuria met with in nephritis, renal calculi and in torsion or compression of the ureter, and these cases represent instances of obstruction in the urinary canals. We will now consider the first group, namely, *reflex anuria.*

Hysterical anuria. It is a well known fact that the secretion of urine is directly under the control of the nervous system by means of the vaso-motor system. By irritation of the vascular center in the medulla oblongata, one can directly influence the amount of urine secreted by the renal parenchyma. Stimulation by electrical currents, or by inducing an accumulation of $CO.^2$ in the blood, one may succeed, if the irritant is of sufficient strength to completely stop the secretion of urine. The point, however, which has by far the greatest importance for the understanding of the production of hysterical anuria, is the resulting complete anuria by reflex which arises during irritation of a sensory nerve. In their experiments, Cohnheim and Rog, by stimulation of the central end of a cut sciatic nerve, successfully produced an extreme contraction of the renal vessels with a diminution in the size of the gland. It is very important to note, as these authorities have shown, that the effect of the irritation was present considerably longer than the duration of the stimulation. These experimental demonstrations form the foundation of the hypothesis of reflex anuria in the human subject. The question now arises as to how

far clinical experiments correspond to those undertaken on animals and whether or not it can be demonstrated as a certainty that cases of purely nervous anuria can be met with, when the renal glands are absolutely normal. I feel that this may be answered in the affirmative, and here cases of hysterical anuria belong. This form usually arises in neurotic individuals, or in diseases or anomalies in the female genital apparatus. The splanchnic nerve becomes irritated and from this arises a cramplike contraction of the renal arteries, while the flow of blood to the kidney completely ceases. Hysteria, which represents a perverted reaction of the nervous system, may give rise to changes in the urine due entirely to nervous influence. The polyuria which frequently follows attacks of the affection is well known, and, although less frequent, oliguria may also occur and be so marked that anuria is reached. Pitres says in his clinical lectures on anuria, that the patients succumb of uremia after a certain time, which may vary from several hours to five or six days on an average, but in hysterical subjects, on the contrary, the anuria may persist for weeks without having any apparent effect on the general health and without causing any danger to life.

If one carefully studies the literature of the subject, it will at once become evident that hysterical patients never give evidence of symptoms of uremia, *if vomiting and diarrhea be excluded.* This has induced several authorities to assume that there exists a vicarious secretion of urea by way of the stomach, and Charcot and others observed that in absolute anuria, vicarious vomiting arose, the vomitus containing a relatively large amount of urea. The quantity of urea in the vomitus increased when the urinary secretion was suppressed, and, consequently, it becomes evident that the stomach possesses power to eliminate a certain portion of the urea accumulated in the blood in cases of anuria. The number of such cases, however, is small and there are probably other ways by which the urea becomes eliminated. That a vicarious secretion of urea may take place in the organism there is no doubt, as the experiments of Claude Bernard and Barreswil show. After removal of the kidneys they demonstrated the presence of urea in the blood, and after profuse vomiting had occurred, it could no longer be discovered. This phenomenon may be explained by the secretion of urea in the intestine and which was

also removed, partly by vomiting and partly by transformation into carbonic acid ammonia. Hammond and Marchand, as well as Oppler, found the presence of urea in the vomitus in their experiments.

One must be extremely careful in making a diagnosis of anuria when one suspects it to be due to hysteria. For instance, in one case, a girl twenty-four years of age, occasionally presented an oliguria, and once absolute uremia lasting for two weeks and accompanied with violent vomiting. The patient was carefully watched, and it was soon discovered that she carried a small pitcher with her which she kept wrapped up in a handkerchief. This pitcher had a very strong odor of urine. When she was unobserved, she would pour small quantities of urine out of the window, and it was also found that she drank some of it and then vomited.

We now come to the consideration of those cases where the anuria is proven to be purely nervous in origin and the kidneys perfectly healthy, and here again, I would refer to Charcot, who published a very well observed instance. The patient presented evidences of severe hysteria; there were convulsions, hemiplegia and hemianesthesia with an oliguria, which had been present for several months, with periods of absolute anuria which lasted eleven days. During the whole time, small amounts of urea were detected in the vomitus. After a deep chloroform narcosis, given for the purpose of breaking up adhesions giving rise to contracted joints, the urine secreted was found normal. This case shows that the long duration of an anuria proves nothing so far as its purely nervous nature is concerned, and this case just quoted was in all probability an angiospastic anuria, and besides, other proofs derived from animal experiments well demonstrate the curative action of the relaxing influence of chloroform narcosis over the vascular spasm. If, then, a nervous anuria really exists, it is probable that it is quite similar to the experimental reflex variety and results from sensory irritation, and this theory appears more or less probable from the two following reported cases. Israel had a twenty-four year old woman under his care presenting a stenosis of the external os, uterine catarrh and constant uterine pain, which was increased at each menstruation. For six months oliguria had been present, accompanied by profuse vomiting and occasional

anuria. After bilateral incision of the cervix, the menstruation following was painless and the oliguria and anuria disappeared. A similar condition was found in a case reported by McBride and Mann, of a woman having intestinal irritation, uterine hypertrophy and a deep bilateral laceration of the cervix and who usually presented an anuria of many hours' duration during menstruation. Injections of morphine did away with the anuria each time they were given, while an operation for the repair of the cervix also did away with it for some time.

Toxic anuria as it occurs occasionally in chronic lead poisoning, can also be traced to a reflex contraction of the renal blood vessels, especially the arteries, but, under these circumstances, oliguria is more frequently present than anuria. The same may be said of oxalic acid and cantharides poisoning.

We now come to the question of reflex anuria arising in an occlusion of one ureter, which may be considered as of reflex nature from the genital tract, and it is of importance to ascertain if sensory irritation affecting one kidney or one ureter is capable of suppressing urinary secretion by reflex action. This may be answered affirmatively and the fact was already known as far back as Morgagni, that in obstruction of one ureter, the opposite kidney might sometimes suspend its functions, so that this great pathologist was led to say: "*nam etsi non semper, hand rarissime tamen contingit, ut uno affecto rene alter quoque in consensum trahatur.*"

Clinically, this form of reflex anuria has been repeatedly met with, and as far as the correctness of the explanation is concerned, namely, that under certain conditions, an inhibitory influence upon the secretion of one kidney on the other can occur, has been proven by physiological experiments. It was long ago demonstrated by Claude Bernard that, by irritation of the nerves entering the hilum of the kidney, anemia and anuria could be produced, while in contradiction to this, Cohnheim and Rog showed that by irritating the renal nerves a marked hypermic tumefaction of the organ, with increased urinary secretion resulted.

It is only recently, however, that investigations have demonstrated the paths over which the vaso-motor nerve fibers run and this is of extreme interest from our point of view. Masius, by making a section of the vagus in the neck of rabbits and dogs,

whether on the right or on the left side, could by irritation of the peripheral end, produce suppression of urine in both kidneys. This phenomenon also took place when the sympathetic was cut in the neck after section of the vagi and the cervical medulla and the central end irritated. From this there resulted a depression in the vaso-constrictor nerve fibers of the kidney, partly in the splanchnic, partly in the cervical vagi, and on account of this dividing course of the vaso-constrictors in the cervical vagi also, it immediately becomes obvious that, in a perfectly simple and clear manner, one may explain the changes observed in the cardiac action, as well as the existing anuria. This has also been proven clinically. For many English surgeons, however, the reality of reflex anuria resulting from functional obstruction of one kidney does not appear at all likely, and they only believe it possible when some serious lesion is present in the second kidney. Legueu rejects the possibility of a reflex action when a renal lesion exists on one side only, or when a calculus becomes lodged in a ureter, and he asserts that in calculous anuria from obstruction of one ureter, the kidney on the other side, if it fails to carry out its functions, does so because it is, or has been, the seat of some lesion. Demons and Pousson admit that anuria arising in cases of obstruction from stone in one ureter may occur, but it must be extremely rare and presumably a diseased kidney also exists, because it is only under these circumstances that the renal function could be interfered with in a reflex way.

Israël also comes to the conclusion that reflex anuria, due to a one-sided obstruction of the ureter, usually only takes place when the opposite kidney is already the seat of disease. The reflex interference of the renal function takes place, according to Guyon, from an insufficient blood supply, due to irritation of the vaso-constrictors and since he upholds that a diseased kidney requires a greater amount of blood than a healthy one, it naturally suffers more markedly under a reflex irritation than when normal.

Animal experiments carried out by Gotze would appear, however, to be in favor of some reflex influence brought to bear on the healthy kidney which may impair the latter's functions in cases of obstruction of one ureter by a calculus. In dogs who passed normal urine, the capacity of each kidney was determined quantitively by inserting a glass tube into each ureter. Salt

solution was then injected into one ureter which increased the pressure in the respective kidney and immediately resulted in a decrease of the secretion of the kidney on the opposite side, and when the pressure was kept up resulted in complete suppression of urinary secretion. The same result was obtained when artificial obstruction of one ureter was produced. Increase of intrarenal pressure of one kidney consequently resulted in arresting the secretion in the opposite gland. From this it would appear that those who have criticised the theory of reflex suppression of urinary secretion, have certainly the merit of having disproven a large number of cases which have been reported as reflex anuria, but, nevertheless, the reflex process which arises in connection with renal operations must still be more generally considered than it has in the past. This relates chiefly to the immediate results on the functions of the remaining kidney after nephrectomy. The physiological process after this operation is much more clearly understood than formerly, since surgeons have done away with the injurious influence of antiseptics on the remaining kidney by employing an aseptic technique, and in looking back we can see that in many cases where anuria occurred immediately after the removal of a kidney, it was in many cases due to the absorption of toxic products employed for sterilization. It becomes evident at the present time, when functional disturbances occur in the remaining kidney after nephrectomy, that in the majority of cases the process is purely a physiological one, due to a reflex condition acting on the innervation of the renal vessels.

In cases of obstruction of one ureter other than from calculus, the easiest and clearest reason for the occurrence of a reflex suppression of secretion, giving rise to a so-called sympathetic anuria, is met with when acute suppression arises in movable kidney. In these cases, at the time of the attack, a decrease in the amount of urine, or even absolute anuria may occur. When the crisis is over the renal function is restored, so that any supposition of any arrest of the secreting functions having pre-existed in the other kidney must be rejected. Israel has reported a case where this fact cannot be denied, in which he observed a distinct reflex inhibitory influence over the left kidney, arising after an acute increase in tension, resulting from a temporary closure of the ureter in a right-sided hydronephrosis.

The kidney was enormously distended from time to time and extremely painful from the tension, and, at the time of the attacks, the amount of urine secreted diminished to practically nothing, but, as soon as the sac was emptied by puncture, a flood of urine was voided by the bladder. This polyuria occurred from the healthy kidney, for the urine voided by the bladder was perfectly normal, whereas that obtained from the hydronephrosis was tinged with blood. In another case Israel was dealing with an increase in intrarenal pressure in one kidney, resulting from bending of an abnormally long ureter, and a suppression of the secretion in the healthy kidney resulted. The occlusion of a left-sided hydronephrosis resulted in a total anuria. The right kidney was incised, and during the operation the renal vein was ruptured, death resulting twenty-eight hours after the operation. Microscopic examination showed that the structure of the right kidney was perfectly normal.

According to these observations it becomes evident how an irritation arising in one kidney can suppress the secreting functions in the opposite organ, and by removal of the existing cause the normal kidney will again regain its physiological functions. A still more evident proof, possessing the positiveness of a physiological experiment, is the occurrence of a reno-renal reflex resulting in oliguria or anuria when the latter condition is overcome after removal of the diseased kidney, during the occurrence of occlusion to the exit of the urine from that side. Here, again, Israel has reported an interesting case. He removed a diseased kidney, and after the operation the amount of urine voided in twenty-four hours amounted to three times the quantity expelled before the operation. Here one is dealing with instances of bending of the ureter and hydronephrosis, resulting in an increased intrarenal pressure, which by reflex action stopped the excretory functions in the opposite gland.

Considering now cases of obstruction due to impaction of a calculus in the ureter on one side, and where anuria results, it is difficult to prove the sympathetic nature of the condition. It may be upheld that one ureter is occluded by a calculus, while the ureter of its fellow may be bent, or the opposite kidney may be diseased and incapable of carrying on its function, or that it may be a rudimentary organ, so that the occluded kidney is in reality

the only one carrying out urinary secretion. It is quite true that such conditions have been frequently observed and reported as instances of reflex anuria, but, nevertheless, there are enough authentic recorded cases to be found, in which an occlusion by a calculus in one ureter has distinctly resulted in a reflex action arresting the functions in the opposite healthy kidney. Legueu is very positive in asserting that there is no such thing as reflex anuria, and when suppression of the urine does occur, it is due to the fact that the patient possesses only one kidney. Personally, I believe that this opinion is too absolute and a case recorded by Israel seems to show that the proposition is untenable in every case. After exposing the left kidney and removing a stone from the hilum in a patient sixty-two years old, Israel noted that the urinary secretion returned immediately and very profusely, both by way of the bladder and through the drainage tube in the left kidney. By the cystoscope it was found that the right kidney, which had not been operated on, secreted normally again, which would seem to prove the reflex nature of the cessation of its function. Legueu, nevertheless, upholds that a reflex calculous anuria cannot exist, and when there is anuria from calculous obstruction, both kidneys must be diseased or only one gland is present. The above mentioned case reported by Israel would seem, however, to prove the contrary, because complete anuria was present with obstruction in one ureter only, which was completely relieved after operation and proved by the cystoscope that urine came into the bladder from the healthy kidney after operation. The following case is interesting in many respects.

A male, thirty-seven years old, with a good family history, had never been ill. Up to within six weeks of the time the patient was first seen, there apparently had not been any renal symptoms. The patient, however, became suddenly ill with pain in both renal regions, accompanied by anorexia and abdominal distension. Since the commencement of the illness, the urine appears to have shown a considerable deposit and at the same time, the amount was markedly decreased.

After judicious medical treatment had been resorted to for several weeks, the urine continued to be passed in very small amounts, was decidedly cloudy and contained a fairly large amount of albumen. A few days before coming under observation, the

amount of urine excreted became less and less, until complete anuria resulted. Up to this time the patient's general condition was fairly good and he did not suffer, but, in order to prevent the appearance of uremic symptoms, he was placed under surgical observation.

When first seen the anuria had been present for a day and a half. Physical examination showed a large, well built man, with slight edema of the feet. The mental condition was not changed other than for some slight confusion. The pulse was weak and about seventy to the minute. The thoracic organs appeared normal and no intestinal symptoms were present. Palpation of the renal region elicited no more pain on the right than on the left, but he stated that the last attacks of pain had occurred on the left.

An operation was undertaken at once, and since the patient complained of more pain on pressure over the left kidney, and as the kidney could be palpated on that side, as well as the objective diagnosis, this gland was presumed to be the one that had retained its functions up to the last. As to the condition of the right kidney and whether or not it had become physiologically without value, was a problem that could not be solved. Likewise the etiology of the anuria could not be made out with any certainty, although a reflex calculous anuria, or obstruction of the ureters with calculi, was considered probable. The left kidney was consequently exposed and was found tumefied and hyperemic, but otherwise apparently normal. The renal pelvis was of normal size and the ureter, as far as it could be palpated, was normal. The kidney was then split open and a small amount of cloudy urine made its exit from the renal pelvis. Retrograde catheterization of the ureter revealed nothing, as the instrument could be pushed into the bladder. The operation was completed by gauze plugging and a drainage tube. The outcome was satisfactory, because, several hours after the operation, large amounts of urine came from the wound, but none from the bladder. This continued for ten days, and then less urine was excreted through the tube, while the quantity expelled by the bladder increased. During convalescence, the patient experienced attacks of pain in the right kidney and with each of these there was a decrease in the amount of urine passed. After eight days the attacks of pain on the

right ceased and did not return, and as the wound was closed and the patient felt perfectly well, he was discharged twenty-five days after the operation. We heard from him three months later, when he stated that he was in the best of health and the amount of urine passed was normal. Seven months after the operation he again complained of pain in the right renal region, but the amount of urine did not decrease, although it was found to contain a considerable amount of albumen. Upon examination, the right renal region appeared tumefied and upon incision, a large amount of pus was let out which surrounded the kidney, but the wound closed kindly in a short time.

From this it would appear that a calculus or calculi were present in the right kidney, and that a pyelonephritis had developed and resulted in a pararenal abscess by which the concretion had made its exit. A year later the patient was in excellent health.

A very similar case has been recorded by Mittag which occurred in von Bramann's clinic and another by Godlee. The latter case is briefly as follows: A physician, thirty-one years of age, suffered from septicemia when a student in 1872, as a result of an injury; otherwise he had been well until the last two years, when he had occasional attacks of right-sided renal colic which were relieved by morphine. The attacks became more severe and associated with anuria, while the urine showed quite an amount of albumen and many hyalin casts. In July, 1885, a deep seated perinephretic abscess was opened, but the kidney could not be discovered. No urine came from the wound and the albumen considerably decreased. In December of the same year complete suppression of urine again occurred, lasting a week. No operation was undertaken, because it was supposed that there was only one functionating kidney whose ureter had been occluded by a calculus. Death took place a week later. Autopsy showed a large pus pocket in the right kidney, with a calculus lodged in the middle of the ureter, above which the tube had become greatly dilated. The left kidney was large and normal, and microscopically only showed evidences of a mild intertitial nephritis. The interesting points in this case are that an abscess in the right kidney could produce such a considerable amount of albumen and casts in the urine, and that the irritation in the right renal g'and could cause complete anuria, although the other organ was com-

paratively healthy. Godlee expressed the opinion in reporting the case, that perhaps the amount of morphine given the patient had some bearing in the production of the anuria.

In a case occurring at the surgical clinic at Halle, a renal abscess on the right side was present, which at times gave rise to considerable albumen in the urine. Here again the irritative process arose in the diseased right kidney producing anuria from its reflex effect on the secretion in the latter.

We now come to reflex anuria arising in traumatism of one kidney and we will first consider direct traumatism. In traumatisms of the kidney, whether they be operative or not, anuria may arise, although the opposite gland may be normal. Marsh and Clarke have met with such instances, although, under the circumstances, one is dealing with a combined action of various factors, which, according to the above mentioned authorities, results in a too complicated process to allow one to consider the condition as a reflex anuria with any certainty. On the other hand, other observers have reported cases which are more important. Butler has published the following case. A laborer, forty-three years old, received a blow on the left side of the abdomen, and, although the region pained him, he continued to work for four days. On the fourth day following the accident, anuria suddenly occurred, accompanied by rigors, nausea and violent pain in the back. When seen on the tenth day after anuria had set in, his breath possessed a distinctly urinous odor and the abdomen was slightly distended. On the next day there was vomiting and muscular twitching during sleep, and two days later he died with all the symptoms of uremia. Autopsy showed a cystic atrophic kidney with a patent ureter. The left kidney was considerably enlarged and bound down by old and new adhesions. The ureter was distended with urine and at its middle was found a complete obliteration; in the radicles of the renal vein, thrombi were found, which at first sight looked like small calculi.

After removal of one kidney, anuria may follow, and if the condition is not overcome, death soon results from uremia. Anuria arises under these conditions, either from the fact that the opposite kidney was diseased to such an extent that its functions had been carried out altogether by the organ removed, or, on the other hand, the heart may have been undergoing pathologic transforma-

tion for some time and its action became weakened from the narcosis and loss of blood which accompany all operative interferences. In the latter case, from the poor blood supply, ischemia of the kidney results, causing rapid degeneration of the renal epithelium and with this, cessation of its functions. Without any doubt disturbances in the kidney occur, which, in some cases, are rapidly overcome, while in others an acute inflammatory process arises, resulting in a dimunition of the secretion, which finally ceases. Autopsies on these cases show either an extreme cloudy or fatty degeneration with necrobiosis of the renal epithelium, or the kidney may present an interstitial infiltration in which the renal epithelium also tends to become considerably involved. In the milder cases a reflex action on the healthy kidney is the result of the anuria, but in other instances other influences, probably of a purely nervous nature, are to be taken into consideration, which are evidently direct irritations far exceeding the physiological point. It is not possible for a perfectly healthy kidney to fail under the burden suddenly imposed upon it by the removal of its fellow, so that one should search for some other influences of specific irritation. Bonardi has shown experimentally that in animals from whom a kidney has been removed under narcosis, the subjects were more susceptible to infections and intoxications. A very serious influence upon the renal epithelium, resulting from the narcotic used, whether in the form of a direct irritation, or ischemia resulting from the narcosis, is most doubtful. One should always take into consideration the absorption of chloroform into the system which, in itself is not dangerous, but combined with other influences is apt to increase the danger.

Certain antiseptic materials when coming into direct contact with a wound surface in large quantities are far more important than either ether or chloroform. The deleterious action on the kidney of carbolic acid, iodoform, and especially bichloride of mercury is well known, and if into the bargain the heart's action becomes weak, a condition not infrequently observed in doing nephrectomy, the danger then increases to a considerable degree. For this reason I am of the opinion that in the removal of a kidney the aseptic technique is the one to be preferred.

In this respect an interesting case of anuria following removal of the kidney, occurring in the surgical clinic of Marburg, has

been reported by Barth. The case was a malignant tumor of the right kidney in a five-year-old child. The decreased amount of urine existing before the operation did not at first undergo any considerable change after the kidney had been removed and the amount excreted even began to increase. The patient convalesced and appeared out of danger, when on the fourteenth day he was nauseated and sleepy, while the amount of urine rapidly diminished, only 40 grams being passed on the next day, which contained albumen and large numbers of red blood cells. On the day following, complete anuria set in with marked uremic symptoms. The pulse was irregular and intermittent. On the following day the condition suddenly changed; the urine was secreted to an amount not reached before, the pulse became regular and all the alarming symptoms disappeared and from this time on the patient rapidly recovered.

The remaining kidney was not enlarged, nor painful, the chemical and miscroscopic changes in the urine were only present during the attack, and examination of the bladder showed it to be perfectly normal. To sum up, it may be said that this was a reflex anuria, probably arising from irritation of the nerves in the stump of the removed right kidney, and this caused a reflex angiospasm in the vessels of the left organ, resulting in a cessation of the secretion. The irritation producing a reflex was probably due to an inflammatory swelling of the granulating wound in which the nerves were imbedded. The change in the heart's action should also be taken into consideration in this case. The pulse was very irregular and markedly intermittent during the attack, a condition of affairs not observed either before or after the attack. This phenomenon may, however, be explained when one takes into consideration the intimate and direct relationship existing between the vagus and the vaso-constrictors of the kidneys as has been demonstrated by Masius.

Israel has recorded several cases of anuria following extirpation of the kidney, but he says that, although complete anuria occurred, it was not the result of reflex influences, but wholly dependent on the weakened condition of the heart. This authority is skeptical regarding reflex anuria, although he does not consider it impossible, and, according to his way of thinking, so many conditions are present during an operation that it would be diffi-

cult to consider the anuria following as due to any one particular cause. In his own cases the patients presented atrophic or parenchymatous changes in the myocardium and from the narcosis, the operative traumatism and so forth, the heart already in a diseased condition was influenced in such a way that the renal activity would become lowered as a result of diminished blood pressure. In point of fact, the latter is certainly of great importance, whether resulting from a weak heart or a reflex vaso-constricting action on the renal vessels. From the development of ischemia, if it persists for any length of time, severe damage to the renal epithelium results but it can recover if the blood supply is not interfered with for too long a time. An increase in the secretion of urine then follows and the fact is clinically of great interest, because, to a certain extent, it represents a physiological reaction of the renal blood supply, or rather, perhaps, its nervous apparatus, upon the pre-existing condition of irritation. An angioparesis of short duration follows angiospasm and, as in animal experiments, results in an abnormal secretion of urine. Clinically, this phenomenon is a very well known occurrence.

The following case is not devoid of interest. A male, forty-one years of age, was seen in the middle of January, 1900, complaining of a fullness in the bladder even when the organ was empty. Five days later a swelling was found just below the region of the stomach, with borders which could not be distinctly defined. Considerable pain was elicited in the tumor upon pressure. The patient complained of pains in the legs and back. The descending colon was found lying over the tumor, which extended from the left renal region down into the pelvis. Inflation of the stomach caused the resistance to disappear. The surface of the tumor appeared smooth. The growth increased in size very rapidly, so that, by the first of February, the patient was extremely weak and edema of the lower extremities appeared. At no time was either albumen or casts found in the urine, but, on February 10, a trace was discovered and the specific gravity 1004. The daily amount had averaged about 1300 grams, when suddenly on February 11 the urine decreased; only about 650 cc. was voided and the next day a little less. On February 14, complete anuria arose. When seen in consultation on this date the patient was found extremely emaciated, with considerable edema

of the lower limbs. The tumor presented in the left hypochondriac region in the form of a hard swelling with a smooth surface and not adherent to the abdominal wall. The growth reached nearly to the median line and its lower borders appeared to be about two fingers' breadth below the umbilicus. It was not movable. The growth in the abdomen might be roughly estimated as the size of an adult head. No fluctuation could be elicited. No functional disturbances of the stomach or intestine. By inflation of the large intestine the descending colon appeared to be displaced towards the middle line and somewhat downwards. The thoracic organs showed no evidence of disease.

Hydronephrosis was eliminated on account of the absence of fluctuation, and, although there was little or no rise in temperature, I did not feel that renal tuberculosis could be eliminated, although I was under the impression that I was more likely dealing with a sarcoma of the left kidney. But it might be either of the two latter diseases which had resulted in anuria, produced by pressure of the ureter from metastases in the mesenteric lymphnodes on the right, with displacement of the left ureter from direct pressure, or, on the other hand, the anuria might be due to retension from compression of the right ureter from growths developing in the small pelvis. The marked edema could be best explained from congestion due to compression on the inferior vena cava.

For the next few days that the patient was under observation, there was complete anuria, proven by catheterization. The edema increased, the patient complained of headache and was constantly nauseated. The pulse ran high and, on account of the threatening uremia it was decided to operate. The right kidney was selected as the organ to be operated on, because it was practically certain that it was the healthy one. Consequently the kidney was exposed by a lumbar incision and split open. The renal pelvis was found somewhat enlarged. The opening in the kidney was packed with gauze. For the next few days large quantities of urine were passed by the drain, it being somewhat cloudy and containing some epithelium presenting characteristics of fatty degeneration. A little urine was also voided from the bladder. The amount of urine coming from the wound and from the bladder varied, and when a small amount was passed by the

tubes the amount in twenty-four hours practically was equalled by the amount passed from the bladder. After the operation the patient's condition varied; at times his mind was clear, the appetite good and the tongue moist, while at others he was mentally confused, vomited, and was persuaded with difficulty to take nourishment. He finally sank and died nine days afterwards. Unfortunately no autopsy could be obtained.

Although more proof is not necessary to show that a reno-renal reflex can result in the cessation of function of the kidney on the opposite side, I, nevertheless, would briefly allude to one case recorded by Israel, that of a young woman, who, after removal of a right-sided hydronephritic kidney, presented reflex anuria due to irritation of the drainage tube on the opposite side which was too long. That this was so is proven from the fact that immediately after the dainage tube was shortened, the amount of urine immediately increased to 3000 cm. and after this polyuria had lasted for several days, the urinary secretion returned to the normal.

In anuria due to cholera, one finds, according to Rosenstein, a marked venous hyperemia of the kidney, the organ being occasionally enlarged. Miscroscopically, casting off and degeneration of the epithelium is noted, although there appears to be an anatomical integrity of the secretory apparatus. The glomeruli of Malpighi, tubules and capsules, as well as the interstitial tissue, appear to be intact. Since the amount of urine voided depends, according to Ludwig and Heidenhain, upon the blood pressure, and the rapidity of the flow in the glomeruli, the anuria occurring in the asphyxic stage of cholera is to be explained from this fact, because, in this stage of the disease, the pulse can hardly be felt, and consequently the circulation practically entirely ceases.

In the beginning of the diffuse nephritides there is usually oliguria, so that the amount of urine in most cases will hardly exceed one hundred ccm. In severe cases anuria may develop and last for one or several days. At the commencement of convalescence, the twenty-four hour amount of urine appears increased and polyuria is not infrequently present. The anuria and oliguria appear to find an explanation through the almost complete blocking up of the urinary canals with casts. Whitelaw describes a case of anuria in a boy eight years old which lasted

twenty-five days, commencing two months after the development of a scarlatina. Exceptional cases, however, occur where the connection between a diffuse nephritis and anuria is not at all clear, in which the suppression of urine suddenly occurs without any previous symptoms of any inflammatory process, and it is only operation or autopsy that reveals the correct condition of affairs. Such a case has been recorded by Israel, where a diffuse nephritis of both glands resulted in complete arrest in secretion of urine. As the anuria arose suddenly without any premonitory symptoms and without any qualitative or quantitative change in the urine, it was impossible to make a diagnosis beforehand.

It is well known that in cases of diffuse nephritis, especially when following scarlet fever, oliguria occurs, but absolute anuria is uncommon. However, anuria is far more infrequent in ascending pyelonephritis than in hematogenous nephritis, for the simple reason that in the former the renal changes are not diffusely spread and exist rather more in the form of foci. Israel, however, has met with complete anuria in a case of left-sided sub-acute ascending pyelonephritis in a patient whose right kidney had been removed eight months previously on account of tuberculosis of the organ. The arrest of secretion is probably to be considered as a result of the acute inflammatory process with increased intrarenal pressure, and from this results a sudden increase in tension, which explains the initial attacks of pain which may readily lead the clinician to make a diagnosis of occlusion from calculus. By slitting open the kidney, the excessive pressure on the parenchyma can be relieved, because the blood, tissue fluids and inflammatory products can be eliminated and circulation is restored throughout the organ.

I now come to consider the most frequent cause of anuria, namely, renal calculus. Complete suppression of urine can more readily be understood in those cases where occlusion of both ureters occurs at the same time, or where only one functionating kidney is present. I have already mentioned how a failure in the functions of the second kidney,—although perfectly capable of functionating,—may arise when the ureter on the other side is obstructed, this being the result of a vaso-constrictor reflex type. Nephrolithiasis is more apt to make itself known after the thirtieth year of life, and generally only gravel and small calculi are voided.

However, as these patients advance in years, the calculi from the kidney become larger in size so that they cannot be expelled by the ureter. Now, if a patient presenting anuria has suffered for a number of years with renal symptoms, and if the passage of the stones has been painful, one should be on the lookout for hydronephrosis. During anuria calculosa, a hydronephrosis would hardly be formed, because the occlusion takes place suddenly, but only for a very short time will the kidney secrete a small amount of urine.

Cohnheim was, I believe, the first to experimentally develop hydronephrosis, and he came to the conclusion that in complete obstruction of the ureter, hydronephrosis can only occur to a mild degree, because the enormous tension set up rapidly produces a failure in the secretory power of the organ, so that very large hydronephrosis arises only in incomplete obstruction of the ureter. Clinically speaking, three possibilities may exist as far as the development of calculous anuria is concerned; either both kidneys with perfect functional integrity are arrested in their secretion from a calculus becoming lodged in the ureter, the same thing occurring in the other very shortly afterwards, or what is more uncommon, at the same time. Secondly, we may have one kidney which is physiologically worthless on account of previous lesions and the only one that is carrying out the work becomes clogged by occlusion of its ureter; and lastly, we have those cases where the patient has only one kidney, the other having been removed for some lesion, or is congenitally absent.

Considering the case of two kidneys in perfect functional order, whose ureters have both become obstructed by a calculus, I am only aware of one recorded case due to Haehner. That occlusion of both ureters must have occurred at about the same time, or within a very short interval, was shown from the fact that the mucosa at the points where the calculi were wedged in, presented ecchymosis and the commencement of an ulcerative process, while the parenchyma of both kidneys gave evidences of the same condition. It is quite true that there are a number of instances of calculous obstruction in both ureters, but in all of them one kidney was always functionally worthless on account of some former lesion. In these cases reflex anuria of course does not exist, but they were frequently classified under this heading, on

account of superficial observation of the case. Bischoff has published a case of anuria which lasted twenty-three days, where both ureters were occluded by calculi, but the right kidney had not been functionally active for a number of years. Several instances of calculous anuria have been recorded by Israel, but they differ in no way from the others.

One is always dealing with the mechanical form of anuria, one where one kidney has been diseased for some time and occlusion of the functionating organ naturally leads to suppression of urine. Thus in Arlowski's case, which resulted in death after anuria of eighteen days' duration, both glands had become physiologically worthless on account of the calculi; while in Ultzmann's case, in which anuria of fourteen days' duration terminated fatally, the right kidney was found obliterated, while the left was double the normal size and a stone was found lodged in the ureter. The literature of all countries is replete with such cases. The following case is especially interesting for the reason that the function of the left kidney was suddenly overcome by occlusion of its ureter with a calculus, while the right kidney had apparently lost its functional powers some time past; these were regained, however, just at the time when an operation was about to be undertaken for the relief of the condition. The patient had frequently had attacks of pain on the right, followed by the passage of calculi, so that it could be reasonably supposed that the right kidney was already diseased. Then renal colic occurred on the left side. Anuria appeared, which lasted for nine days, so that it was decided to operate, but, while being prepared for the operation, the patient suddenly began to pass urine and two days later a calculus, the size of a pea, was voided.

The third possibility for the occurrence of calculous anuria, aside from reflex anuria, is where only one kidney exists. It is true that, so far as I am aware, only two instances of anuria arising after the removal of one kidney have been encountered. One instance occurred in the practice of Dr. Lewis S. Pilcher, to whose courtesy I am greatly indebted for the privilege of reporting this case which has not as yet been published; the second was reported by Kammerer, at the March, 1906, meeting of the N. Y. Surgical Society. A male, thirty-two years of age, was admitted to the Methodist Episcopal Hospital in Brooklyn, N. Y., on

October 8, 1905, with a history that in December, 1902, after an uncertain period of previous symptoms, he had been subjected to a nephrolithotomy of the left kidney by Dr. A. T. Bristow at the King's County Hospital. A fistula persisted after this operation, in consequence of which he was again admitted to the same hospital in July, 1904, in the service of Dr. William Maddren, by whom a complete extirpation of the left kidney was done. From this operation he made a good recovery with complete healing of the operative wound. He remained well thereafter until September 1, 1905, when he began to complain of pain in the region of the remaining right kidney. This had persisted with remissions and exacerbations for five weeks, during which time he was under medical treatment, but without relief.

On the evening of October 8, the pain suddenly became very severe, and was attended with vomiting and a rise in temperature. On account of this attack he was brought to the Methodist Episcopal Hospital for treatment, with the statement that no urine had been passed since the attack began. Examination revealed rigidity of the abdominal muscles in the right hypochondriac region; tenderness on pressure in the right lumbar region, where an enlarged right kidney was palpable. Temperature 101°.6; pulse 120; respiration 40. Blood examination:—white blood corpuscles 19,400, polynuclear leucocytes 87%. Nine hours after admission he was catheterized and less than half a teaspoonful of urine was obtained from the bladder. Twelve hours after admission the right kidney was exposed by a lumbar incision. It was found swollen, congested and edematous.

The renal pelvis was much distended, and when incised, several ounces of urine gushed from the opening under great tension. Some pus was mingled with the urine. Through the opening in the renal pelvis twenty-three calculi, varying in size from that of a split pea to a hickory nut, were then removed and the interior of the cavities in the kidney was thoroughly irrigated. A sound was passed down into the ureter, which was found patent.

The outlet from the pelvis of the kidney had evidently been blocked by one of the calculi which had been removed. A rubber drain tube was inserted down into the renal pelvis and the incision in the latter was closed by chromic gut down to the tube. The greater portion of the operative incision was closed by sutures,

a moderate tampon of iodoform gauze being placed around the tube from skin to kidney. For the first twenty-four hours after the operation, the discharges from the wound were very slightly urinous in odor and no urine passed down into the bladder, as ascertained by the passage of the catheter. Nitroglycerin and an abundant ingestion of fluids were then prescribed. During the second twenty-four hours, 105 ounces of urine were voided from the bladder. From this time the function of the kidney and bladder continued normal. The drainage tube gave issue to a slight amount of urine during the first ten days. On the fourteenth day the drainage tube was discontinued, after which the sinus rapidly closed. The patient made an uneventful convalescence and was discharged cured at the end of five weeks from his admission.

Dr. Frederick Kammerer's case was that of a woman, forty-one years old, who first came under his care in July, 1895. Her history dated back for two years, and consisted essentially of frequent attacks of renal colic on both sides. On the right side she had a large tumor corresponding with the site of the right kidney. The urine was filled with pus, and the woman was in a septic condition.

On July 10, 1895, Dr. Kammerer exposed and incised the right kidney, and evacuated a large amount of pus. In the pelvis of the organ a large calculus was found which could only be removed by breaking it up. The patient's condition was such that a nephrectomy was deemed inadvisable at that time. The kidney was therefore drained, and about two months later, after an unsuccessful attempt to induce the fistula to close, the kidney was removed; the wound thereupon healed kindly. The urine still contained a small amount of pus, but there was no further pain on that side.

On February 21, 1897, the patient was suddenly seized with a pain in the left side. For several days her temperature ranged about 103, with very scanty urine, and severe pain over the left kidney. On February 21, she passed about 200 c.c. of urine. On the following day a still smaller quantity was voided, and on February 23, at 5 A. M., complete anuria set in. After fifteen hours had elapsed, Dr. Kammerer cut down on the kidney. He found the pelvis of the organ, as well as the ureter, much distended. He

incised the latter about one inch from its junction to the pelvis, and evacuated a quantity of purulent urine; then, on inserting the finger, he found three small stones in the pelvis of the kidney, which he removed. With a probe he also made out a calculus in the ureter, about four inches from the junction of the ureter with the pelvis, and after freeing the former from the surrounding tissues, he was able to push the stone up into the incision and extract it. Drainage of the kidney was resorted to through an incision into the substance of the organ, and for several weeks the course of the case gave rise to some anxiety. On the fifth day the packing was removed, and five catgut stitches were inserted to close the incision into the ureter. There was still slight leakage at that point, but in the course of a month, both the incision into the ureter and into the kidney tissue had closed, and the further recovery of the patient was uneventful.

Eight years have elapsed since the second operation, and the patient still remains in excellent health. With the exception of a few pus corpuscles, the urine is quite free, and her pain has entirely disappeared.

A case of anuria has been reported by Meyer which occurred thirty-eight days after nephrectomy and was due to obstruction of the ureter by clots and pus. Nephrotomy was performed successfully. During life it is possible to make a diagnosis of the presence of only one kidney, but sometimes it is only at autopsy that this is discovered. In this respect I would mention Schwengers' case. The patient had always been well up to the time of an anuria which lasted nine days. This was ushered in with severe pain on the right side and death resulted. Autopsy revealed the absence of the left kidney, not even a rudimentary organ being found. Occlusion by a calculus lodged in the ureter was the cause of the anuria.

The diagnosis of calculous anuria can ordinarily be made from the history of the case, because these patients generally have been previously troubled by urinary symptoms, such as the passage of gravel or a calculus. Colicky pains and blood in the urine precede in many cases the passage of a stone, but, on the other hand, every symptom may be lacking, the anuria suddenly occurring without any warning. Now, since anuria is not an infrequent symptom of nephrolithiasis, this condition should be first con-

sidered, but some difficulty may be encountered in those cases where the patient gives no distinct history of past trouble. However, the first thing that comes to one's mind is whether or not a calculous obstruction exists in both ureters, or only in one, and, in the latter, upon which side, Then, if it is ascertained that both ureters are obstructed, it is most important to determine which kidney was the last affected, because when the functionating kidney becomes the object of operation, the outlook is good if the obstruction can be removed, as the other kidney may have been physiologically worthless for some time. In order to come to a correct conclusion, the history given by the patient himself will greatly help, because he will probably be able to give information as to the side he first felt the pain in. When the answers relative to pain are definite, one should always bear in mind the possibility that the last pains felt may have been in the diseased kidney, due to a reno-renal reflex and this has been shown in a case reported by Israel. The objective findings are hardly worth considering, for even if by purely objective diagnosis the other kidney is found diseased, it still remains questionable whether it is the cause of the anuria and perhaps functionally worthless for a considerable length of time, and whether or not if the remaining functionating kidney were attacked an operation would relieve the anuria. The pain resulting from pressure on the obstructed side is not of much value, but Israel considers as a valuable symptom a marked rigidity of the abdominal walls on palpation, which occurs on the side where the kidney was the last occluded. As to the value of catheterization of the ureters opinions vary. As this can only be done with a very fine and rather soft bougie, there is a question whether or not the instrument would allow one to recognize the presence of a calculus when it came in contact with it, because the instrument may become caught in a fold of the mucous membrane of the ureter which is swollen and inflamed, or it may be grasped by a spasm of the ureter. However, if a stone should be diagnosticated, the kidney may have been destroyed for some time and the obstruction may have been present for many years, while the remaining kidney has only become physiologically involved recently. Now, supposing a stone should be detected in the ureter of the latter, it is questionable whether the obstructing calculus is not located in the ostium of the renal pelvis. The

passage would consequently then be free and the only infallible sign is when no urine is seen by the cystoscope making its exit from the ureteral orifice. Of equally little value is radioscopy, because the stone is not always made evident. Consequently one may say that the kidney to be operated on is the one which was the seat of the last pain, or when this cannot be ascertained with certainty, then one should operate on the gland, which, on palpation, gives rise to the greatest pain, or on the side where the greatest reflex rigidity of the abdominal walls is found.

As to the time when the operation should be undertaken, it at once becomes evident in looking over the reported cases that the result of the operation depends entirely upon this factor. Israel advises not waiting longer than forty-eight hours if the obstruction is not removed after this time, and statistics plead in favor of a timely interference. Legueu showed in 1891 that the number of cures of calculous anuria where operation was undertaken amount to 66.6%, while of those left alone only 28.5% recovered. Other French authorities opine for early interference.

When Tuffier introduced nephrotomy in 1890, surgeons began to attack all renal calculi and those situated in the upper part of the ureter by splitting open the kidney, and personally, I feel prepared to say that when the obstacle in the ureter cannot be removed, the kidney should always be opened in order to give exit to the urine.

Relative to those cases of anuria whose cause is due to ureteral obstruction from blood clot or compression from without, it may be said that they are rare, and it is probable under these circumstances that the other kidney is functionally destroyed. Some years ago I treated the question of anuria resulting from extension of carcinoma of the uterus, in a paper published in the *Boston Medical and Surgical Journal,* so I will not refer to it again here. Anuria is certainly very rare as the result of compression of the ureter, but Farlow reported a case in the above mentioned journal in 1889, where death occurred in twelve days. The patient was a woman thirty-five years of age, and autopsy revealed a firm, fibrous mass inclosing the walls of the ureter. The ureters and renal pelves were considerably dilated. Patel remarks, in considering anuria resulting from compression of the ureters by ab-

dominal tumors, that both ureters are rarely obstructed at the same time. Now, if anuria occurs, it must be that both kidneys are diseased or that the kidney whose ureter is free has been deprived of its physiological functions by reflex action. He regards the explanation given in those cases which have been reported, as unsatisfactory and believes that only the first theory is correct, basing his assertion on a thoroughly observed case occurring in Poncet's clinic.

In closing this paper, I cannot refrain from recording one case of anuria of puerperal origin, and where I feel quite certain that had I done a nephrotomy, the patient might possibly have been saved. As it was, bilateral decapsulation was done, and, although some improvement manifested itself, the patient died four days after the operation. The history of the case is briefly as follows: A young woman, twenty-six years of age, was delivered on a Saturday evening, the labor requiring only the application of the low forceps. Everything was perfectly normal until at noon on the Thursday following, the patient was taken with a rigor and the temperature immediately rose to about 39.5° C., the pulse following it proportionately. The attending physician rightly suspecting that some uterine infection was showing itself, immediately resorted to intra-uterine irrigations. On the same evening the patient, who had voided no urine during the day, was catheterized and the bladder found empty.

After the irrigation the temperature did not go up and the pulse returned to nearly normal, but from this time on complete anuria existed. I saw the patient in consultation on Sunday morning, *i. e.*, after the anuria had been present for about sixty hours, and made the following notes. Mind perfectly clear, pupils normal, tongue moist but furred. Pulse 80, temperature normal. Bimanual examination revealed nothing abnormal in the genital apparatus. There was no edema other than a slight puffiness under the eyes.

The patient was immediately removed to a private hospital, where a radical treatment to combat the suppression of urine was immediately undertaken, consisting of hot packs, pilocarpin subcutaneously, and acetate of potash internally, with a milk diet. This treatment was carried out for forty-eight hours without attaining any result, and not a drop of urine could at any time be

obtained from the bladder. On the next day the edema of the face became more marked and also appeared at the ankles, while the pulse increased in rapidity and was of a wiry nature. On Tuesday morning, that is to say five days and a half since the commencement of the anuria, the condition was the same, but the edema had become more marked, so that operation was immediately decided upon. Narcosis with ethyl chloride and ether. Bilateral decapsulation was done at one sitting, my assistant, Dr. Rolfe, doing one kidney, while I did the other. The glands were exposed by transverse incision, and were found greatly enlarged, tense and extremely hyperemic. Decortication was rapidly accomplished, as the kidney popped from its capsule like a pea from a pod. Capsules were resected, the kidneys dropped back and the wounds sutured. Duration of the operation, thirteen minutes.

During the next twenty-four hours the patient voided 270 cc. of very albuminous urine containing casts; in the next twenty-four hours 300 cc. were voided, but during the next twenty-four suppression again became complete, the edema markedly increased, the mouth became dry and the patient was delirious. She died sixteen hours later.

The autopsy revealed absolutely nothing abnormal in the abdominal viscera, and miscroscopical examination of the kidneys showed that we were dealing with an acute parenchymatous nephritis, as had been diagnosed clinically.

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BOOK REVIEWS

Differential Diagnosis and Treatment of Disease. By AUGUSTUS CAILLE, M. D. New York, 1906. (D. Appleton & Company.)

This excellent work is in reality a compendium of the practice of medicine, surgery and the various specialties, but so arranged as to make it particularly of use to the general practitioner, leaving aside theoretical details, and only covering knowledge necessary for the proper treatment of patients in daily practice.

Particular prominence is given to hygienic, prophylactic, dietetic, hydrotherapeutic, and physical methods of treatment, although the materia medica has not been slighted.

The book is well illustrated and printed.

The Urethrotomies and Kidney Capsulotomy. By REGINALD HARRISON, F. R. C. S. London, 1906. (John Bale, Sons and Danielsson.)

This neat little volume of some ninety-six pages represents Mr. Harrison's recent clinical lectures at the London Medical Graduates' College and Polyclinic.

Like all of Mr. Harrison's writings the present book is concise, clear, and to the point. It is hardly necessary to say that the teachings are sound and give one an up-to-date idea of the various topics treated in its pages.

Berliner Arzneiverordnungen. By DR. PAUL RECKZEH. Berlin, 1906. (S. Karger.)

It is quite a pity that in America we do not publish some similar book to the one under consideration, for there is much contained in a small bulk, most suitable for the office table.

To all those desirious of having a ready reference book for prescription writing we can recommend this one, as it is thorough and correct.